REMARKS

Upon entry of the above amendment, the claims will be 8-12.

The above amendment is responsive to points set forth in the Official Action. However, before discussing this in detail, it is noted that claim 1 as previously amended was amended based on the original claim 1 of the International Application rather than amended claim 1 from the International Preliminary Examination Report. Due to this error, it appears that the claims were rejected as indefinite and lacking antecedent basis. However, in the present claims, claim 8 replaces claim 1 and essentially corresponds to that in the International Preliminary Examination Report.

The remaining claims 9-12 correspond to previous claims 2, 3, 6 and 7, respectively.

Accordingly, no new matter and no new issues have been raised and entry of this Amendment is respectfully requested.

Claims 1-3, 6 and 7 are again rejected under 35 U.S.C. 102(b) as being clearly anticipated by the disclosure of either one of these references as applied in the Norwegian Search Report: Mazanec et al., (5,306,411) or Thorogood et al. (5,240,480) or Mazanec et al. (5,714,091) or EPO 0,438,902 or NO 306014.

This rejection is respectfully traversed for reasons set forth in the Response dated April 1, 2003, keeping in mind that previous claim 1 was incorrectly formulated in lacking the word "membrane" and the definition of y'.

Thus, it is apparent that the previous claims, had they been correctly formulated, and the present claims are unobvious from the cited references.

In this regard, the remarks in the Response of April 1, 2003 at pages 4-6 are incorporated by reference herein.

Additionally, Applicants comment on the cited references:

U.S. 5,306,411 (1) describes a membrane formed from a perovskite. Said membrane however, does not include Al (aluminum) contrary to the membrane according to the present invention. The membrane according to the present invention is represented by the formula as shown in claim 1 where $y' > 0$, i.e. the membrane shall include aluminum.

The membrane according to the present invention is not disclosed or suggested by U.S. 5,240,480 (2). According to (2) the ratio between the A-type and B-type cations shall be 1, while said ratio shall be greater than 1 for the membrane according to the present invention; i.e. $v/w > 1$ while in (2) $x + x' + x'' = 1$ and $y + y' + y'' = 1$. Please note page 12, line 12 - page 13, line 18 in the present specification where it is explained why it is important that said ratio be greater than 1.

Similarly, this is also true for the material described in U.S. 5,714,091 (3). The ratio between the A-type and B-type cations shall be 1 for the material in (1). Furthermore, the material disclosed in (3) does not include aluminum.

The material disclosed in EPO 438902 (4) and NO 306014 (5) is identical to the material disclosed in (1) and (3), respectively. Hence, no further comments are necessary for these two references.

For the foregoing reasons, it is apparent that the rejection on the foregoing references, alone or combined, is untenable and should be withdrawn.

In Official Action paragraph 5, the Examiner has again rejected claims 1-3, 6 and 7 as being clearly anticipated by the disclosure of Cable et al. (US 5,910,238)(6).

(6) describes mixed metal oxides represented by the formula:

$(A_{1-a}A'_a)(B_bB'_{1-b})O_{3-c}$

consisting of a wide range of elements and compositions. Strictly speaking, the nomenclature of this formula restricts compositions to those having a 1:1 ratio of A-type and B-type cations, since $1-a+a=1-b+b=1$. A, A', B and B' clearly represent elements, but are apparently also numerically confused. Presumably, $0.9 \leq (A+A')/(B+B') \leq 1.1$, which therefore strictly speaking is meaningless, indicates a range in the A-type to B-type cation ratio.

The compositions claimed in (6) encompass a total number of 36 elements. The formula describes hundreds, if not thousands, of mixed metal oxides described in the open literature prior to the date of filing.

Given the general nature of the formula of (6), it is true that the formula encompasses the compositions described by previous claim 1 (new claim 8). However, to translate this formula to the specific compositions described by previous claim 1 (new claim 8), the following restrictions have to be made:

- A contains not a mixture of cations, but only one.
- A' contains not a mixture of cations, but only one.

- b = 0 (i.e. B is absent).
- B' contains not less than two cations and not more than three.
- 0<a<1

After applying these restrictions, A may still represent any one of 19 elements, A' any one of 6 elements, and B' any combination of two or three from a selection of 10 elements. Hence, given all these restrictions to the general formula of (6), a total of 19x6x(45+120)=18810 combinations remain. Of these 18810 combinations only two coincide with the compositions of previous claim 1 (new claim 8).

It is common knowledge that among the countless compositions encompassed by the general formula of (6), there are countless compositions that may be used to transport oxygen in a laboratory experiment. However, confronted with the task of identifying a composition for use in an industrial application, the challenge is of a different nature than merely picking any of these countless compositions. The present patent application claims specific compositions as a result of demonstrating in a detailed and thorough manner the advantages of certain compositional features (see figures and examples). This demonstration shows why the vast majority of compounds encompassed by a general formula like the one given in (6) are not useful as oxygen membranes.

One of the most important and novel features of the present invention is the demonstration of the importance of the A/B cation ratio of a perovskite $A_AB_BO_3$. Normally this ratio equals one. (6) claims compositions with $0.9 \leq (A+A')/(B+B') \leq 1.1$.

However, according to Table 1 of (6), preferably $0.99 \leq (A+A')/(B+B') \leq 1.01$. Hence, an intention to deviate from the normal ratio of 1 is not demonstrated in (6). The present invention, however, demonstrates (see Examples 12-15 and Figs. 4, 8-10) that mixed metal oxide perovskites with A/B cation ratios equal to one will be unstable to kinetic decomposition, while those with ratios higher than one will be stable, i.e. when $v=1$ and $0.95 \leq w \leq 1$. The A/B ratio therefore will have a strong influence on the lifetime of the membrane.

Thus, (6) with its countless compositions does not anticipate or render obvious the specific composition of the present patent application.

Furthermore, in (6) no information or knowledge regarding properties of compositions is communicated, other than a categorization of compositions into, on one hand "electronic conductors", and on the other "ionic and mixed ionic/electronic conductors". In fact, the compositions of the general formula encompassing the compositions of previous claim 1 (new

claim 8) are listed as electronic conductors in Table 1 of (6). (6) does not anticipate the composition of previous claim 1 (new claim 8) as an oxygen membrane. Therefore, according to the information given in (6), the composition of previous claim 1 (new claim 8) would not be expected to be useful as an oxygen membrane but, at best, an electronic conductor.

The present invention, however, demonstrates that the present oxygen separation membranes are particularly suitable as membrane materials in processes in which the membrane is subjected to a large potential gradient, e.g. oxygen partial pressure difference of 6-7 decades or more across the membrane. Compared with compositions known in (6) these compositions offer improved resistance to kinetic decomposition and reduced chemical expansion, as well as improved stability against reduction to metal and reaction with carbon dioxide and water.

Based on the above arguments, the present invention must be considered as a so-called "selection invention" where inventiveness lies in a particular selection from a broadly known field. Thus, the subject matter of claims 1-3 must be considered to be novel and unobvious in the light of the disclosure of (6)

In reply to Official Action paragraph 6, the above amended claims and foregoing remarks are fully responsive.

Accordingly, the rejections on prior art are untenable and should be withdrawn.

No further issues remaining, allowance of this application is respectfully requested.

If the Examiner has any comments or proposals for expediting prosecution, please contact undersigned at the telephone number below.

Respectfully submitted,

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July 11, 2003